4764. (amended) A method of treating a coal formation in situ, comprising:

providing heat from one or more heaters to at least a portion of the formation;

allowing the heat to transfer from the one or more heaters to a part of the formation such that the heat from the one or more heaters pyrolyzes at least some of the hydrocarbons within the part of the formation;

producing pyrolysis products from the formation;

heating at least a portion of the part of the formation to a temperature sufficient to generate synthesis gas;

controlling a temperature of at least a portion of the part of the formation to generate synthesis gas having a selected $H_2$ to CO ratio;

providing a synthesis gas generating fluid to at least the portion of the part of the formation to generate synthesis gas; and

producing a portion of the synthesis gas from the formation.

4765. (amended) The method of claim 4764, wherein the one or more heaters comprise at least two heaters, and wherein superposition of heat from at least the two heaters pyrolyzes at least some hydrocarbons within the part of the formation.

4776. (amended) The method of claim 4764, further comprising allowing the heat to transfer from the one or more heaters to the part of the formation to substantially uniformly increase a permeability of the part of the formation.

4777. (amended) The method of claim 4764, further comprising controlling heat transfer from the one or more heaters to produce a permeability within the part of the formation of greater than about 100 millidarcy.

4778. (amended) The method of claim 4764, further comprising heating at least the portion of the part of the formation when providing the synthesis gas generating fluid to inhibit temperature decrease within the part of the formation during synthesis gas generation.

4780. (amended) The method of claim 4764, wherein heating at least the portion of the part of the formation to a temperature sufficient to allow synthesis gas generation comprises:

heating zones adjacent to wellbores of one or more heaters with heaters disposed in the wellbores, wherein the heaters are configured to raise temperatures of the zones to temperatures sufficient to support reaction of hydrocarbon material within the zones with an oxidizing fluid;

introducing the oxidizing fluid to the zones substantially by diffusion;

allowing the oxidizing fluid to react with at least a portion of the hydrocarbon material within the zones to produce heat in the zones; and

transferring heat from the zones to the part of the formation.

4781. (amended) The method of claim 4764, wherein heating at least the portion of the part of the formation to a temperature sufficient to allow synthesis gas generation comprises:

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introducing an oxidizing fluid into the formation through a wellbore;

transporting the oxidizing fluid substantially by convection into the portion of the part of the formation, wherein the portion of the part of the formation is at a temperature sufficient to support an oxidation reaction with the oxidizing fluid; and

reacting the oxidizing fluid within the portion of the part of the formation to generate heat and raise the temperature of the portion.

4782. (amended) The method of claim 4764, wherein at least one of the one or more heaters comprises an electrical heater.

4783. (amended) The method of claim 4764, wherein at least one of the one or more heaters comprises a natural distributed combustor.

4784. (amended) The method of claim 4764, wherein the one or more heaters comprise one or more heater wells, wherein at least one heater well comprises a conduit disposed within the formation, and further comprising heating the conduit by flowing a hot fluid through the conduit.

4785. (amended) The method of claim 4764, wherein heating at least the portion of the part of the formation to a temperature sufficient to allow synthesis gas generation and providing a synthesis gas generating fluid to at least the portion of the part of the formation comprises introducing steam into the portion.

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4786. (amended) The method of claim 4764, further comprising controlling the heating of at least the portion of part of the formation and provision of the synthesis gas generating fluid to maintain a temperature within at least the portion of the part of the formation above the temperature sufficient to generate synthesis gas.

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4789. (amended) The method of claim 4764, wherein the synthesis gas generating fluid comprises water and carbon dioxide, wherein the carbon dioxide inhibits production of carbon dioxide from the part of the formation.

4793. (amended) The method of claim 4764, wherein providing the synthesis gas generating fluid to at least the portion of the part of the formation comprises raising a water table of the formation to allow water to flow into at least the portion of the part of the formation.

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4794. (amended) The method of claim 4764, wherein the synthesis gas generating fluid comprises water and hydrocarbons having carbon numbers less than 5, and wherein at least a portion of the hydrocarbons are subjected to a reaction within at least the portion of the part of the formation to increase a $H_2$ concentration within the produced synthesis gas.

4795. (amended) The method of claim 4764, wherein the synthesis gas generating fluid comprises water and hydrocarbons having carbon numbers greater than 4, and wherein at least a portion of the hydrocarbons react within at least the portion of the part of the formation to increase an energy content of the produced synthesis gas.

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4799. (amended) The method of claim 4764, further comprising using a portion of the synthesis gas as a combustion fuel for the one or more heaters.

4800. (amended) A method of treating a coal formation in situ, comprising:

providing heat from one or more heaters to at least a portion of the formation;

allowing the heat to transfer from the one or more heaters to a part of the formation such that the heat from the one or more heaters pyrolyzes at least some hydrocarbons within the part of the formation;

producing pyrolysis products from the formation;

heating at least a portion of the part of the formation to a temperature sufficient to generate synthesis gas;

C6 controlling a temperature in or proximate to a synthesis gas production well to generate synthesis gas having a selected $H_2$ to CO ratio;

providing a synthesis gas generating fluid to at least the portion of the part of the formation to generate synthesis gas; and

producing synthesis gas from the formation.

4801. (amended) The method of claim 4800, wherein the one or more heaters comprise at least two heaters, and wherein superposition of heat from at least the two heaters pyrolyzes at least some hydrocarbons within the part of the formation.

4812. (amended) The method of claim 4800, further comprising allowing the heat to transfer from the one or more heaters to the part of the formation to substantially uniformly increase a permeability of the part of the formation.

C7 4813. (amended) The method of claim 4800, further comprising controlling heat transfer from the one or more heaters to produce a permeability within the part of the formation of greater than about 100 millidarcy.

4814. (amended) The method of claim 4800, further comprising heating at least the portion of the part of the formation when providing the synthesis gas generating fluid to inhibit temperature decrease within the part of the formation during synthesis gas generation.

4816. (amended) The method of claim 4800, wherein heating at least the portion of the part of the formation to a temperature sufficient to allow synthesis gas generation comprises:

heating zones adjacent to wellbores of one or more heaters with heaters disposed in the wellbores, wherein the heaters are configured to raise temperatures of the zones to temperatures sufficient to support reaction of hydrocarbon material within the zones with an oxidizing fluid;

introducing the oxidizing fluid to the zones substantially by diffusion;

allowing the oxidizing fluid to react with at least a portion of the hydrocarbon material within the zones to produce heat in the zones; and

transferring heat from the zones to the part of the formation.

4817. (amended) The method of claim 4800, wherein heating at least the portion of the part of the formation to a temperature sufficient to allow synthesis gas generation comprises:

introducing an oxidizing fluid into the formation through a wellbore;

transporting the oxidizing fluid substantially by convection into the portion of the part of the formation, wherein the portion of the part of the formation is at a temperature sufficient to support an oxidation reaction with the oxidizing fluid; and

reacting the oxidizing fluid within the portion of the part of the formation to generate heat and raise the temperature of the portion.

4818. (amended) The method of claim 4800, wherein at least one of the one or more heaters comprises an electrical heater.

4819. (amended) The method of claim 4800, wherein at least one of the one or more heaters comprises a natural distributed combustor.

4820. (amended) The method of claim 4800, wherein the one or more heaters comprise one or more heater wells, wherein at least one heater well comprises a conduit disposed within the formation, and further comprising heating the conduit by flowing a hot fluid through the conduit.

4821. (amended) The method of claim 4800, wherein heating at least the portion of the part of the formation to a temperature sufficient to allow synthesis gas generation and providing a synthesis gas generating fluid to at least the portion of the part of the formation comprises introducing steam into the portion.

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4822. (amended) The method of claim 4800, further comprising controlling the heating of at least the portion of part of the formation and provision of the synthesis gas generating fluid to maintain a temperature within at least the portion of the part of the formation above the temperature sufficient to generate synthesis gas.

4829. (amended) The method of claim 4800, wherein providing the synthesis gas generating fluid to at least the portion of the part of the formation comprises raising a water table of the formation to allow water to flow into at least the portion of the part of the formation.

4830. (amended) The method of claim 4800, wherein the synthesis gas generating fluid comprises water and hydrocarbons having carbon numbers less than 5, and wherein at least a portion of the hydrocarbons are subjected to a reaction within at least the portion of the part of the formation to increase a $H_2$ concentration within the produced synthesis gas.

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4831. (amended) The method of claim 4800, wherein the synthesis gas generating fluid comprises water and hydrocarbons having carbon numbers greater than 4, and wherein at least a portion of the hydrocarbons react within at least the portion of the part of the formation to increase an energy content of the produced synthesis gas.

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4835. (amended) The method of claim 4800, further comprising using a portion of the synthesis gas as a combustion fuel for the one or more heaters.

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5150. (new) A method of treating a coal formation in situ, comprising:

providing heat from one or more heaters to at least a portion of the formation;

allowing the heat to transfer from the one or more heaters to a part of the formation such that the heat from the one or more heaters pyrolyzes at least some of the hydrocarbons within the part of the formation;

heating at least a portion of the part of the formation to a temperature sufficient to generate synthesis gas;

controlling a temperature of at least a portion of the part of the formation to generate synthesis gas having a selected $H_2$ to CO ratio;

providing a synthesis gas generating fluid to at least the portion of the part of the formation to generate synthesis gas; and

producing a portion of the synthesis gas from the formation.

5151. (new) The method of claim 5150, wherein the one or more heaters comprise at least two heaters, and wherein superposition of heat from at least the two heaters pyrolyzes at least some hydrocarbons within the part of the formation.

5152. (new) The method of claim 5150, wherein the selected ratio is controlled to be approximately 2:1 $H_2$ to CO.

5153. (new) The method of claim 5150, wherein the selected ratio is controlled to range from approximately 1.8:1 to approximately 2.2:1 $H_2$ to CO.

5154. (new) The method of claim 5150, wherein the selected ratio is controlled to be approximately 3:1 $H_2$ to CO.

5155. (new) The method of claim 5150, wherein the selected ratio is controlled to range from approximately 2.8:1 to approximately 3.2:1 $H_2$ to CO.

5156. (new) The method of claim 5150, further comprising providing at least a portion of the produced synthesis gas to a condensable hydrocarbon synthesis process to produce condensable hydrocarbons.

5157. (new) The method of claim 5156, wherein the condensable hydrocarbon synthesis process comprises a Fischer-Tropsch process.

5158. (new) The method of claim 5157, further comprising cracking at least a portion of the condensable hydrocarbons to form middle distillates.

5159. (new) The method of claim 5150, further comprising providing at least a portion of the produced synthesis gas to a catalytic methanation process to produce methane.

5160. (new) The method of claim 5150, further comprising providing at least a portion of the produced synthesis gas to a methanol-synthesis process to produce methanol.

5161. (new) The method of claim 5150, further comprising providing at least a portion of the produced synthesis gas to a gasoline-synthesis process to produce gasoline.

5162. (new) The method of claim 5150, further comprising allowing the heat to transfer from the one or more heaters to the part of the formation to substantially uniformly increase a permeability of the part of the formation.

5163. (new) The method of claim 5150, further comprising controlling heat transfer from the one or more heaters to produce a permeability within the part of the formation of greater than about 100 millidarcy.

5164. (new) The method of claim 5150, further comprising heating at least the portion of the part of the formation when providing the synthesis gas generating fluid to inhibit temperature decrease within the part of the formation during synthesis gas generation.

5165. (new) The method of claim 5150, wherein the temperature sufficient to allow synthesis gas generation is within a range from approximately 400 °C to approximately 1200 °C.

5166. (new) The method of claim 5150, wherein heating at least the portion of the part of the formation to a temperature sufficient to allow synthesis gas generation comprises:

heating zones adjacent to wellbores of one or more heaters with heaters disposed in the wellbores, wherein the heaters are configured to raise temperatures of the zones to temperatures sufficient to support reaction of hydrocarbon material within the zones with an oxidizing fluid;

introducing the oxidizing fluid to the zones substantially by diffusion;

allowing the oxidizing fluid to react with at least a portion of the hydrocarbon material within the zones to produce heat in the zones; and

transferring heat from the zones to the part of the formation.

5167. (new) The method of claim 5150, wherein heating at least the portion of the part of the formation to a temperature sufficient to allow synthesis gas generation comprises:

introducing an oxidizing fluid into the formation through a wellbore;

transporting the oxidizing fluid substantially by convection into the portion of the part of the formation, wherein the portion of the part of the formation is at a temperature sufficient to support an oxidation reaction with the oxidizing fluid; and

reacting the oxidizing fluid within the portion of the part of the formation to generate heat and raise the temperature of the portion.

5168. (new) The method of claim 5150, wherein at least one of the one or more heaters comprises an electrical heater.

5169. (new) The method of claim 5150, wherein at least one of the one or more heaters comprises a natural distributed combustor.

5170. (new) The method of claim 5150, wherein the one or more heaters comprise one or more heater wells, wherein at least one heater well comprises a conduit disposed within the formation, and further comprising heating the conduit by flowing a hot fluid through the conduit.

5171. (new) The method of claim 5150, wherein heating at least the portion of the part of the formation to a temperature sufficient to allow synthesis gas generation and providing a synthesis gas generating fluid to at least the portion of the part of the formation comprises introducing steam into the portion.

5172. (new) The method of claim 5150, further comprising controlling the heating of at least the portion of part of the formation and provision of the synthesis gas generating fluid to maintain a temperature within at least the portion of the part of the formation above the temperature sufficient to generate synthesis gas.

5173. (new) The method of claim 5150, wherein the synthesis gas generating fluid comprises liquid water.

5174. (new) The method of claim 5150, wherein the synthesis gas generating fluid comprises steam.

5175. (new) The method of claim 5150, wherein the synthesis gas generating fluid comprises water and carbon dioxide, wherein the carbon dioxide inhibits production of carbon dioxide from the part of the formation.

5176. (new) The method of claim 5175, wherein a portion of the carbon dioxide within the synthesis gas generating fluid comprises carbon dioxide removed from the formation.

5177. (new) The method of claim 5150, wherein the synthesis gas generating fluid comprises carbon dioxide, and wherein a portion of the carbon dioxide reacts with carbon in the formation to generate carbon monoxide.

5178. (new) The method of claim 5177, wherein a portion of the carbon dioxide within the synthesis gas generating fluid comprises carbon dioxide removed from the formation.

5179. (new) The method of claim 5150, wherein providing the synthesis gas generating fluid to at least the portion of the part of the formation comprises raising a water table of the formation to allow water to flow into at least the portion of the part of the formation.

5180. (new) The method of claim 5150, wherein the synthesis gas generating fluid comprises water and hydrocarbons having carbon numbers less than 5, and wherein at least a portion of the hydrocarbons are subjected to a reaction within at least the portion of the part of the formation to increase a $H_2$ concentration within the produced synthesis gas.

5181. (new) The method of claim 5150, wherein the synthesis gas generating fluid comprises water and hydrocarbons having carbon numbers greater than 4, and wherein at least a portion of the hydrocarbons react within at least the portion of the part of the formation to increase an energy content of the produced synthesis gas.

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5182. (new) The method of claim 5150, further comprising maintaining a pressure within the formation during synthesis gas generation, and passing produced synthesis gas through a turbine to generate electricity.

5183. (new) The method of claim 5150, further comprising generating electricity from the synthesis gas using a fuel cell.

5184. (new) The method of claim 5150, further comprising generating electricity from the synthesis gas using a fuel cell, separating carbon dioxide from a fluid exiting the fuel cell, and storing a portion of the separated carbon dioxide within a spent section of the formation.

5185. (new) The method of claim 5150, further comprising using a portion of the synthesis gas as a combustion fuel for the one or more heaters.

5186. (new) A method of treating a coal formation in situ, comprising:

heating at least a portion of the part of the formation to a temperature sufficient to generate synthesis gas;

controlling a temperature in or proximate to a synthesis gas production well to generate synthesis gas having a selected $H_2$ to CO ratio;

providing a synthesis gas generating fluid to at least the portion of the part of the formation to generate synthesis gas; and

producing synthesis gas from the formation.

5187. (new) The method of claim 5186, wherein the selected ratio is controlled to be approximately 2:1 $H_2$ to CO.

5188. (new) The method of claim 5186, wherein the selected ratio is controlled to range from approximately 1.8:1 to approximately 2.2:1 $H_2$ to CO.

5189. (new) The method of claim 5186, wherein the selected ratio is controlled to be approximately 3:1 $H_2$ to CO.

5190. (new) The method of claim 5186, wherein the selected ratio is controlled to range from approximately 2.8:1 to approximately 3.2:1 $H_2$ to CO.

5191. (new) The method of claim 5186, further comprising providing at least a portion of the produced synthesis gas to a condensable hydrocarbon synthesis process to produce condensable hydrocarbons.

5192. (new) The method of claim 5191, wherein the condensable hydrocarbon synthesis process comprises a Fischer-Tropsch process.

5193. (new) The method of claim 5192, further comprising cracking at least a portion of the condensable hydrocarbons to form middle distillates.

5194. (new) The method of claim 5186, further comprising providing at least a portion of the produced synthesis gas to a catalytic methanation process to produce methane.

5195. (new) The method of claim 5186, further comprising providing at least a portion of the produced synthesis gas to a methanol-synthesis process to produce methanol.

5196. (new) The method of claim 5186, further comprising providing at least a portion of the produced synthesis gas to a gasoline-synthesis process to produce gasoline.

5197. (new) The method of claim 5186, further comprising heating at least the portion of the part of the formation when providing the synthesis gas generating fluid to inhibit temperature decrease within the part of the formation during synthesis gas generation.

5198. (new) The method of claim 5186, wherein the temperature sufficient to allow synthesis gas generation is within a range from approximately 400 °C to approximately 1200 °C.

5199. (new) The method of claim 5186, wherein heating at least the portion of the part of the formation to a temperature sufficient to allow synthesis gas generation comprises:

introducing an oxidizing fluid into the formation through a wellbore;

transporting the oxidizing fluid substantially by convection into the portion of the part of the formation, wherein the portion of the part of the formation is at a temperature sufficient to support an oxidation reaction with the oxidizing fluid; and

reacting the oxidizing fluid within the portion of the part of the formation to generate heat and raise the temperature of the portion.

5200. (new) The method of claim 5186, wherein heating at least the portion of the part of the formation to a temperature sufficient to allow synthesis gas generation and providing a synthesis gas generating fluid to at least the portion of the part of the formation comprises introducing steam into the portion.

5201. (new) The method of claim 5186, further comprising controlling the heating of at least the portion of part of the formation and provision of the synthesis gas generating fluid to maintain a temperature within at least the portion of the part of the formation above the temperature sufficient to generate synthesis gas.

5202. (new) The method of claim 5186, wherein the synthesis gas generating fluid comprises liquid water.

5203. (new) The method of claim 5186, wherein the synthesis gas generating fluid comprises steam.

5204. (new) The method of claim 5186, wherein the synthesis gas generating fluid comprises water and carbon dioxide.

5205. (new) The method of claim 5204, wherein a portion of the carbon dioxide within the synthesis gas generating fluid comprises carbon dioxide removed from the formation.

5206. (new) The method of claim 5186, wherein the synthesis gas generating fluid comprises carbon dioxide, and wherein a portion of the carbon dioxide reacts with carbon in the formation to generate carbon monoxide.

5207. (new) The method of claim 5206, wherein a portion of the carbon dioxide within the synthesis gas generating fluid comprises carbon dioxide removed from the formation.

5208. (new) The method of claim 5186, wherein providing the synthesis gas generating fluid to at least the portion of the part of the formation comprises raising a water table of the formation to allow water to flow into at least the portion of the part of the formation.

5209. (new) The method of claim 5186, wherein the synthesis gas generating fluid comprises water and hydrocarbons having carbon numbers less than 5, and wherein at least a portion of the

hydrocarbons are subjected to a reaction within at least the portion of the part of the formation to increase a $H_2$ concentration within the produced synthesis gas.

5210. (new) The method of claim 5186, wherein the synthesis gas generating fluid comprises water and hydrocarbons having carbon numbers greater than 4, and wherein at least a portion of the hydrocarbons react within at least the portion of the part of the formation to increase an energy content of the produced synthesis gas.

5211. (new) The method of claim 5186, further comprising maintaining a pressure within the formation during synthesis gas generation, and passing produced synthesis gas through a turbine to generate electricity.

5212. (new) The method of claim 5186, further comprising generating electricity from the synthesis gas using a fuel cell.

5213. (new) The method of claim 5186, further comprising generating electricity from the synthesis gas using a fuel cell, separating carbon dioxide from a fluid exiting the fuel cell, and storing a portion of the separated carbon dioxide within a spent section of the formation.

## Response To Office Action Mailed September 10, 2002

### A. Pending Claims

Claims 4764-4835 and 5150-5213 are currently pending. Claims 4764, 4765, 4776-4778, 4780-4786, 4789, 4793-4795, 4799-4801, 4812-4814, 4816-4822, 4829-4831, and 4835 have been amended. Claims 4699-4763 and 4836-4871 have been cancelled without prejudice. Claims 5150-5213 are new.

**B. Restriction**

Applicant hereby elects the claims of Group II, namely claims 4764-4835, drawn to a method of heating a coal formation to a temperature sufficient to generate synthesis gas while controlling the temperature to generate and produce a synthesis gas having a selected $H_2$ to CO ratio, without traverse. Applicant reserves the right to file divisional applications capturing the subject matter of the non-elected species.

**C. Conclusion**

Applicant believes that no fees are due in association with the filing of this document. If any extension of time is required, Applicant hereby requests the appropriate extension of time. If any fees are required, please charge those fees to Conley, Rose & Tayon, P.C. Deposit Account Number 50-1505/5659-07400/EBM.

Respectfully submitted,

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